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Obstructed Nasolacrimal Duct System in Epiphora: Long-term Results of Dacryocystoplasty by Means of Balloon Dilation[1]

PURPOSE: To evaluate the long-term results of balloon dacryocystoplasty in the treatment of epiphora due to obstruction of the nasolacrimal ducts.

MATERIALS AND METHODS: One hundred eyes in 84 patients with complete or incomplete obstruction of the lacrimal sac and duct were selected for dacryocystoplasty. A catheter with a balloon diameter of 3 mm was used. Follow-up was 5–48 months. No stents were placed. A Kaplan-Meier analysis was used to evaluate patency.

RESULTS: The long-term primary patency rate was 70% ± 7 (± standard error). Repeat dacryocystoplasty was successful in 10 of the 11 cases with initial failure or reobstruction during follow-up, which yielded a long-term secondary patency rate of 81% ± 7. There was no association between the length of the obstruction or the duration of symptoms before dacryocystoplasty and the initial and long-term success. Initial and long-term success was statistically significantly higher in dacryocystoplasty for an incomplete obstruction rather than for a complete obstruction.

CONCLUSION: The long-term results of dacryocystoplasty, followed if necessary by repeat dacryocystoplasty, are good. Dacryocystoplasty is a safe and simple procedure and could become the treatment of choice for epiphora due to obstruction of the nasolacrimal ducts. Dacryocystorhinostomy is indicated when dacryocystoplasty or repeat dacryocystoplasty fails or when dacryocystoplasty is contraindicated (eg, in anatomic malformations in the lacrimal duct or bony canal).

EPIPHORA, or tearing, can be caused by reflex hypersecretion of tears owing to infection, irritation of anatomic origin (eg, eyelid malformations, trichiasis), and obstruction of the lacrimal drainage system. Epiphora due to obstruction is generally treated surgically by means of dacryocystorhinostomy. Since 1990, a limited number of publications have reported on the results of dacryocystoplasty, a nonsurgical treatment that involves fluoroscopically guided balloon dilation (1–5). However, only a limited number of cases with limited follow-up have been reported on.

Between September 1992 and September 1996, we performed dacryocystoplasty in 100 eyes in 84 patients. The first objective of this study was to evaluate the long-term primary patency of the nasolacrimal system after dacryocystoplasty. The second objective was to determine whether patency is associated with the duration of the epiphora and the length or severity of the obstruction.

MATERIALS AND METHODS

Patient Selection

Initial selection was done by the referring ophthalmologists (including K.M.), who performed a full ophthalmologic examination to exclude active dacryocystitis and reflex hypersecretion. Subsequently, the nasolacrimal duct system was irrigated with physiologic saline. When the results of this test suggested the presence of an obstruction, patients were referred to the Department of Radiology, De Tjongerschans Hospital, Heerenveen, The Netherlands, for subtraction dacryocystography to establish the type and length of the obstruction. Subtraction dacryocystography was performed with a nonionic, water-soluble contrast medium (iopromide [Ultravist 300 R; Schering, Berlin, Germany]) administered through a small lacrimal catheter inserted into the inferior canaliculus.

If a severe obstruction distal to the canaliculi was found, subtraction dacryocystography was repeated after wedging the superior lacrimal point with a second, nonconducting lacrimal catheter to prevent reflux of contrast medium and to determine whether the obstruction was complete or partial. A total obstruction at any point was considered to be present when, after wedging of the second lacrimal point, dacryocystography showed no passage of contrast medium beyond that point. In cases of total obstruction, dacryocystoplasty entails recanalization by using a guide wire. The obstruction was defined as partial when passage of contrast medium was observed with or without wedging of the second lacrimal point.

Patients were selected for dacryocystoplasty if a complete or partial obstruction was diagnosed at the lacrimal sac, the junction between the lacrimal sac and duct, the duct, or the valve of Hasner, irrespective of the length of the obstruction, the duration of the epiphora, or the patient's age. Exclusion criteria were stenosis at the inferior, superior, or common canaliculus (which, as stressed by Glatt [6], involves a risk of damage to the lacrimal pump); acute dacryocystitis or other specific, acquired nasolacrimal sac and duct obstructions, such as posttraumatic ob-

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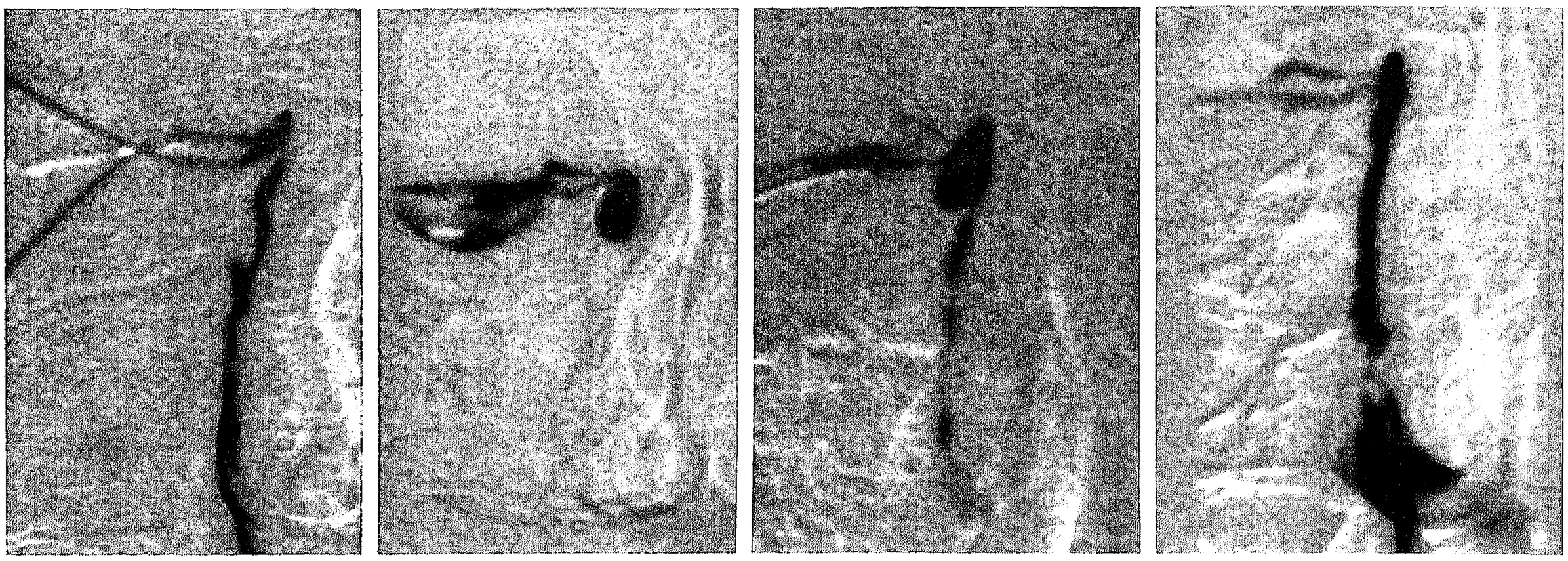


a. b. c. d.

Figure 1. Obstructions selected for dacryocystoplasty. **(a)** Digital subtraction dacryocystographic image shows partial obstruction of the lacrimal sac at the level of the common canaliculus. **(b)** Digital subtraction dacryocystographic image shows complete obstruction at the level of the junction between the lacrimal sac and duct. The lacrimal sac is dilated. **(c)** Digital subtraction dacryocystographic image shows partial obstruction at the level of the junction between the lacrimal sac and nasolacrimal duct and severe stenosis of the lacrimal duct. **(d)** Digital subtraction dacryocystographic image shows partial obstruction at the level of the valve of Hasner. Note the rare absence of the common canaliculus. The canaliculi enter the lacrimal sac separately.

struction of the bony canal; tumors (eg, papilloma, carcinoma); sarcoidosis; or Wegener granulomatosis. If dacryocystographic findings were suggestive of any of these diagnoses or if during dacryocystoplasty the guide wire could not be passed with ease, immediate (preferably by using contrast medium in the lacrimal duct) computed tomography (CT) of the lacrimal duct system was performed. Figure 1 shows some obstructions selected for dacryocystoplasty; Figure 2 shows some obstructions excluded from dacryocystoplasty.

Patient Population

Dacryocystoplasty was performed in 100 eyes (49 left eyes, 51 right eyes) in 84 patients (59 female, 25 male; age range, 1–82 years; mean age, 61.3 years). In 16 patients, dacryocystoplasty was performed in both the left and the right eyes, in one session in some cases. The youngest patient, a 1-year-old girl, had congenital nasolacrimal duct obstruction, which was frequently complicated by infection and did not respond to probing. All other cases of epiphora were idiopathic, that is, were due to primary acquired nasolacrimal duct obstruction. The duration of epiphora varied from 1 to 76 years (mean, 6.0 years).

Epiphora was evaluated subjectively according to the scale of Munk and colleagues (1), which has also been used in other studies (3–5): grade 0 indicates no epiphora; grade 1, occasional epiphora that requires drying or dabbing less than twice a day; grade 2, epiphora that requires drying two to four times a day; grade 3, epiphora that requires drying five to 10 times a day; grade 4, epiphora that requires drying more than 10 times a day; and grade 5, constant tear overflow. All patients had severe epiphora grade 5 ($n = 99$) or grade 4 ($n = 1$).

At dacryocystography, complete ($n = 27$) or partial ($n = 73$) obstruction was found and the site and length of the obstruction were established. The obstructions were of the lacrimal sac ($n = 51$), the junction between the lacrimal sac and the duct ($n = 62$), the lacrimal duct ($n = 51$), the valve of Hasner ($n = 27$), and, frequently, a combination of these sites. After the patient had been fully informed of the procedure and informed consent was obtained, dacryocystoplasty was performed in the same session or shortly thereafter.

Technique

Dacryocystoplasty was performed on an outpatient basis after topical anesthesia. Two to four drops of 0.4% oxybuprocaine hydrochloride (Monofree R; Bournonville-Pharma, Almere, The Netherlands) were applied to the conjunctival sac, a small amount of 1% lidocaine (Xylocaine 1%; Astra, Rijswijk, The Netherlands) was mixed with the iopromide used in dacryocystography, and 10% lidocaine (Xylocaine R spray 10%; Astra) was delivered to the nasal mucosa by means of a nebulizer. In the first group of 26 cases, dacryocystoplasty was performed with a nontraumatizing, 0.025-inch guide wire with a flexible curved tip (Terumo, Tokyo, Japan), a small lacrimal catheter (sialography catheter; PBN Medicals, Stenløse, Denmark) and a rigid balloon catheter with a diameter of 4.5 F, a balloon 3 mm in diameter and 2 cm in length, and a tip of 5 mm distal to the balloon (DCDS-100; Cook Europe, Eindhoven, The Netherlands). In some cases, the tip prevented access to an obstruction high in the lacrimal sac.

In the next group of 74 cases, we used a modified method. For dacryocystoplasty, we used a shapable, hydrophilic, coated, 0.025-inch guide wire (NaviGuide; Meditech/Boston Scientific, Maastricht, The Netherlands); a 20-gauge, 51-mm, soft, plastic vascular sheath (Abbocath; Abbott Ireland, Sligo, Republic of Ireland); and a highly flexible, 3.4-F balloon catheter with a balloon diameter of 3 mm and a balloon length of 2 cm (No Tip Bijou 3.0-20; Schneider [Europe], Bülach, Switzerland). This catheter has no tip distal to the balloon; thus, even a stenosis high in the lacrimal sac can be reached.

The guide wire was curved at the tip by hand, and the vascular sheath was curved at the tip over a wire loop by immersing it in hot water (Fig 3). After dilation of the lacrimal point, the vascular sheath was introduced over the wire into the inferior or superior canaliculus and advanced to the common canaliculus. By rotating the sheath, the sharp curve between the common canaliculus and the lacrimal sac was straightened. Under fluoroscopic guidance, the guide wire was gently advanced to the lacrimal sac and duct down to the inferior meatus of the nasal cavity, followed by the sheath. The 0.025-inch wire was removed from the sheath and replaced with a 0.018-inch wire with a flexible curved tip (Terumo). Changing wires is necessary because the balloon catheter is adjusted to a 0.018-inch wire.

At the start of the procedure, we used a 0.025-inch wire because of its good shapability, pushability, and visibility under fluoroscopy. The balloon catheter was passed retrogradely over the wire until the deflated balloon touched the tip of the vascular sheath. The guide wire was clipped on either side of the sheath-catheter combination. With fluoroscopic control, we positioned the balloon catheter at the site of the stenosis by pushing the catheter upward with one hand and pulling the wire and vascular sheath partially out of the canaliculus with the other.

The balloon was inflated twice for 30 seconds. The wire and the balloon catheter

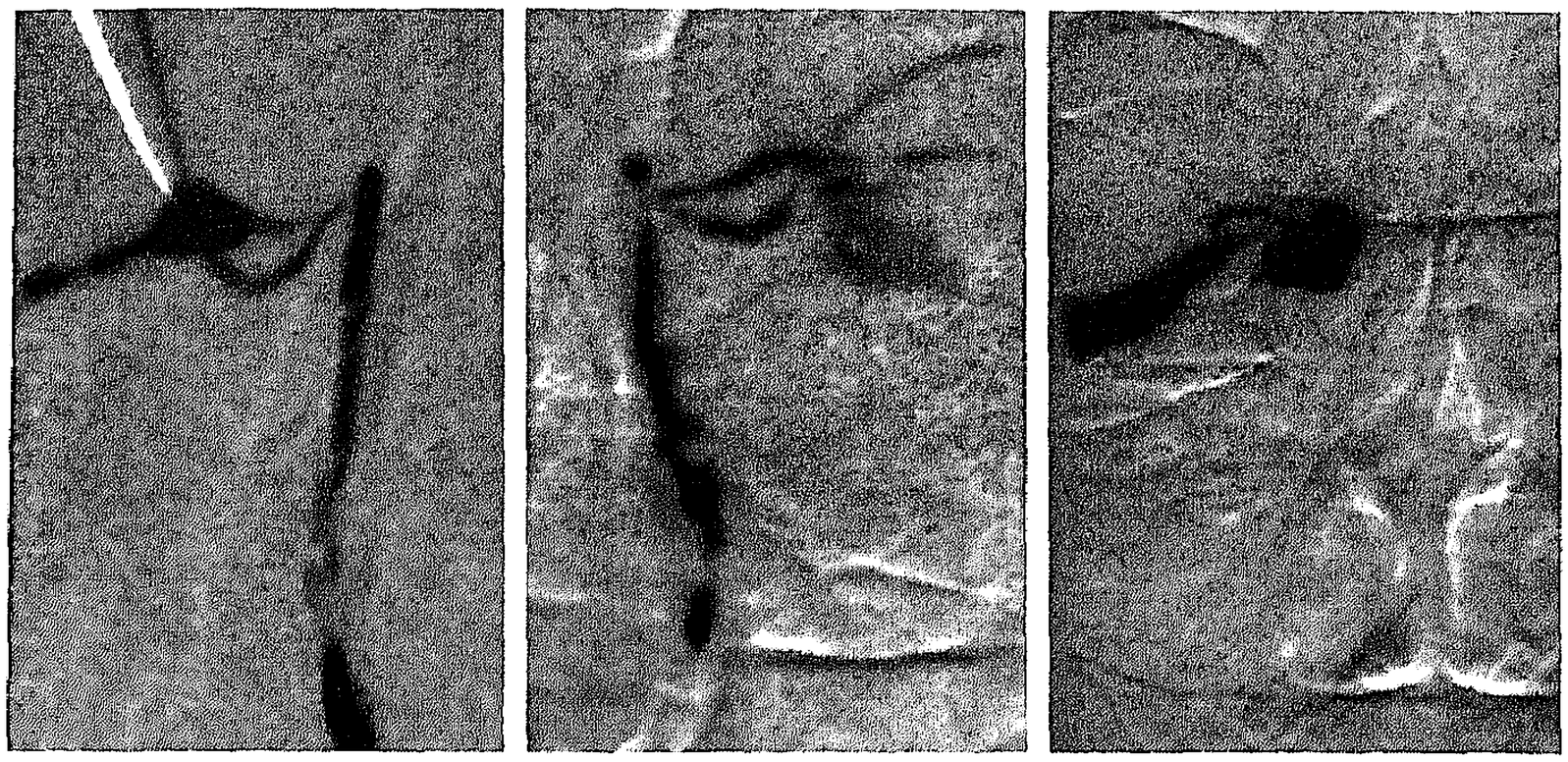


Figure 2. Obstructions not selected for dacryocystoplasty. (a) Digital subtraction dacryocystographic image shows partial obstruction of the common canaliculus and the superior canaliculus adjacent to it. (b) Digital subtraction dacryocystographic image shows partial obstruction of a lacrimal sac not selected for dacryocystoplasty because of the severe partial obstruction of the common canaliculus and the inferior canaliculus. (c) Digital subtraction dacryocystographic image shows complete obstruction of the lacrimal sac in a patient with Wegener granulomatosis. A guide wire could not pass the obstruction. (d) CT scan obtained in the same patient as in c shows septal destruction and destruction of the bony lacrimal canal on both sides and the formation of granulomas. (e) CT scan shows complete obstruction of the lacrimal duct that could not be passed with a guide wire. Note the nasal polyposis. One of the polyps has destroyed the right bony lacrimal canal. (f) CT scan shows complete obstruction of the left lacrimal duct as a complication of a Caldwell-Luc operation in which the left bony lacrimal canal was damaged.

were then removed, and the lacrimal system was irrigated with physiologic saline through the vascular sheath. This was followed by irrigation of the lacrimal ducts with 0.5 mL (2 mg) of dexamethasone (prepared according to the formulary of the Dutch Pharmacists). Simultaneously, the vascular sheath was pulled out of the canaliculus.

After the procedure, eye drops (1 mg/mL dexamethasone and 3 mg/mL gentamicin sulfate [Dexamytrex]; Tramedico, Weesp, The Netherlands; one drop six times daily in the involved eye for 1 week) were prescribed.

All patients were followed up with office examination by their ophthalmologist (including K.M.) within 2 months after the procedure. Long-term success was evaluated by interviewing the patients at the end of follow-up, again by using the scale of Munk and colleagues (1). A good result was defined as epiphora grades 0 and 1, and a poor result as epiphora grades 2–5. The follow-up was 5–48 months (mean, 21 months). The procedure caused no complications. During balloon dilation, some of the patients experienced mild pain; however, there was no need for sedation, except in our youngest patient.

Analysis

The nasolacrimal duct system of one eye was used as the unit of analysis, because it is the clinically relevant unit. A Kaplan-Meier analysis was used to evaluate cumulative primary and secondary patency. Univariate analysis of the association between covariates and the initial and long-term success was performed by using the Pearson χ^2 test. A P value of less than .05 was considered to indicate a statistically significant difference.

RESULTS

Long-term primary patency was 70% ± 7 (± standard error), and long-term secondary patency was 81% ± 7. A plateau has not yet been reached, but a tendency can be observed. Primary patency was defined as a good result without further intervention and was evaluated with Kaplan-Meier survival analysis (Fig 4, Table 1). The patency curves originate at a point less than 1; the y intercept represents the probability of immediate clinical success.

Immediate clinical failures occurred in four eyes (in two eyes, epiphora grade 5 remained unchanged; in two eyes, epiphora grade 5 was reduced to grade 3). There were 18 reobstructions during follow-up: eight after treatment of a complete obstruction, and 10 after treatment of a partial obstruction. The obstructions occurred 1–36 months after dacryocystoplasty (mean, 8.1 months; the four initial failures are excluded). Fourteen reobstructions (which includes the four immediate clinical failures) occurred in the 1st year. One year after treatment, another eight reobstructions occurred, bringing the total to 22 reobstructions. All reobstructions originated from epiphora grade 5 and were grade 3 (in six eyes), grade 4 (in two eyes), and grade 5 (in 14 eyes) after dacryocystoplasty.

In addition to the evaluation of cumulative primary and secondary patency, we evaluated whether initial and long-term success rates were associated with the (*a*) duration of symptoms before dacryocystoplasty (ie, ≤1 year [31 eyes] or >1 year [69 eyes]), (*b*) length of obstruction (ie, a short obstruction restricted to one level [38 eyes] or an obstruction extended to two, three, or four levels [62 eyes]), and (*c*) degree of obstruction at dacryocystography (ie, complete obstruction [27 eyes] or partial obstruction [73 eyes]) (Tables 2–7). The analysis demonstrated no relationship between initial or long-term success and the duration of epiphora (Tables 2 and 3) or the length of the obstruction (Tables 4 and 5). Partial and complete obstructions, however, showed a difference in initial and long-term success rates after dacryocystoplasty. Both the initial success and the long-term success were higher in cases with partial obstruction than in cases with complete obstruction ($P = .03$ and $P = .006$, respectively) (Tables 6 and 7).

All patients with initial failure or reobstruction during follow-up (22 eyes) were offered repeat dacryocystoplasty. In 11 cases, the patient refused to undergo an additional procedure. In the other 11 cases (two of four eyes with initial failure and nine of 18 eyes

with reobstruction during follow-up), repeat dacryocystoplasty was successful in 10 eyes (epiphora grade 0), and epiphora declined from grade 3 to grade 2 in one eye.

DISCUSSION

Traditionally, epiphora due to obstruction of the lacrimal duct has been treated surgically with dacryocystorhinostomy, which involves the removal of bone between the lacrimal sac and nasal mucosa. Subsequently, the lacrimal sac and nasal mucosa are opened and sutured to each other, which results in a bypass of the lacrimal duct. In 1990, Munk and colleagues (1) developed a nonsurgical alternative. They performed dacryocystoplasty with balloon dilation of the nasolacrimal drainage apparatus. A balloon catheter was passed retrogradely over a guide wire that had been inserted antegradely into the lacrimal duct.

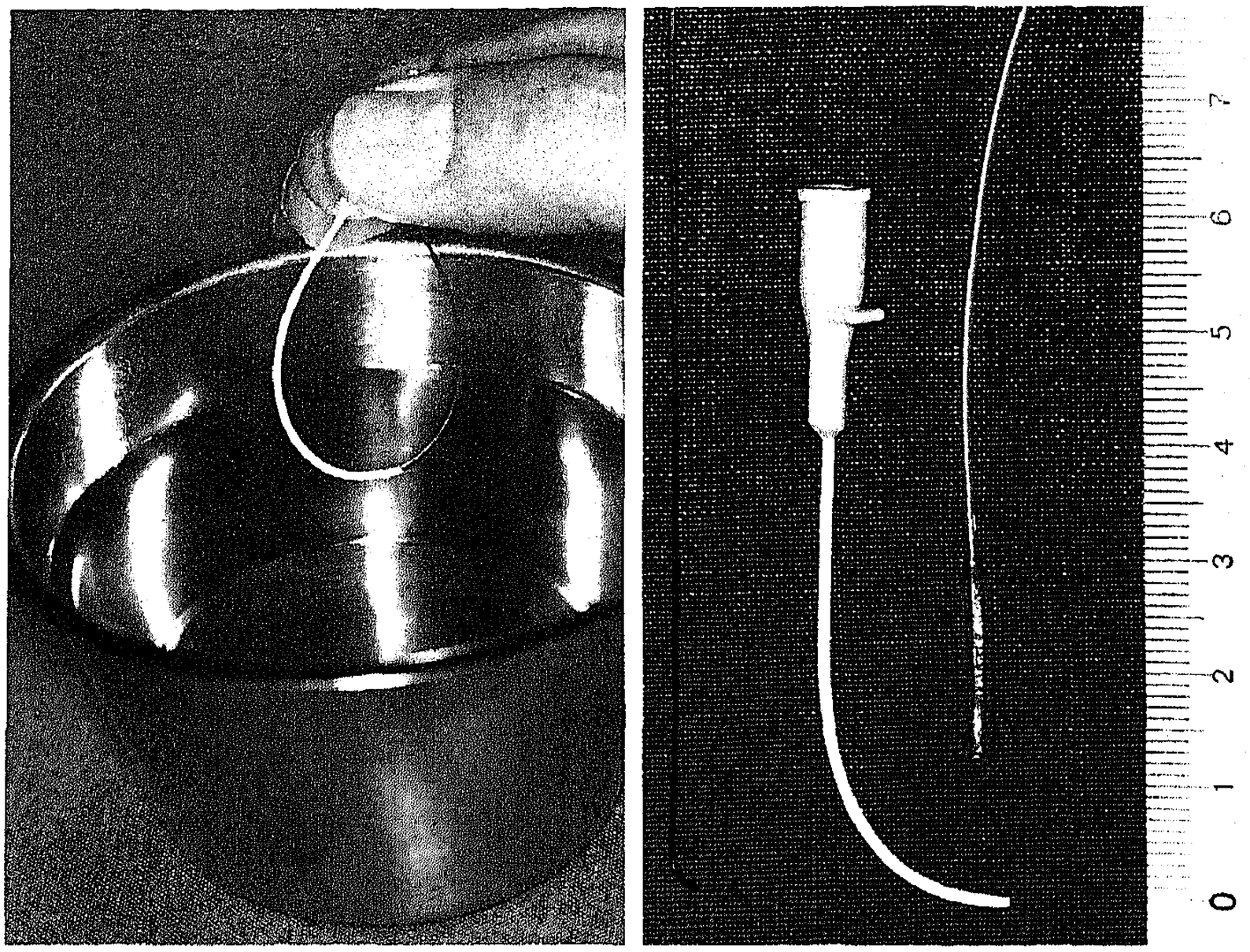
Different authors have reported varying results of dacryocystoplasty in series that usually involve a limited number of patients and limited follow-up. A few studies with larger numbers of patients and longer follow-up have been reported on. In 1994, Lee and colleagues (3) published the results of dacryocystoplasty in 81 eyes with a maximum follow-up of 30 months. They found an overall cumulative patency rate of 23%. In 1995, Ilgit and colleagues (5) reported the results of dacryocystoplasty in 80 eyes with a maximum follow-up of 18 months. Their overall initial success rate was 69%. However, restenosis occurred in 26% during follow-up. In our study, we had a primary patency rate of 70% after dacryocystoplasty in 100 eyes with a follow-up of 5–48 months.

The differences in results can probably be explained by differences in patient selection and different dacryocystoplasty techniques. The results reported by Lee and colleagues (3) may have been negatively affected by the inclusion of eight patients with posttrauma obstruction and possible deformation of the bony lacrimal canal and 13 patients with stenosis of the common canaliculus. Ilgit and colleagues (5) also included 13 patients with stenosis of the common canaliculus, which was dilated by using a 2-mm balloon. We did include patients with posttrauma obstruction, but only after we performed CT of the lacrimal duct system to evaluate the bony lacrimal canal. We excluded patients with an obstruction at the common canaliculus.

Ilgit and colleagues (5) included six patients with a reobstruction after dacryocystorhinostomy. In these patients, dacryocystoplasty involved dilation of the opening between the lacrimal sac and the nose. We treated one patient with a reobstruction after dacryocystorhinostomy. Dacryocystography and CT of the lacrimal duct system showed that the opening made during surgery was completely closed and the continuity of mucosa and bone completely restored. In this patient, dacryocystoplasty of the original obstruction of the nasolacrimal duct was successful.

CT of the lacrimal duct system can be very helpful in patient selection, because it shows both facial skeletal bone and adjacent soft tissues (7,8). We performed conventional axial CT immediately after dacryocystography with administration of the residual, water-soluble iopromide that is left in the nasolacrimal duct system. CT of the lacrimal duct system is indicated in patients with posttrauma obstruction (9), patients with previous dacryocystorhinostomy failure (10), or if the guide wire cannot be passed with ease during dacryocystoplasty.

Another explanation of the differences in results can be the use of different techniques. We used nonmetal, atraumatic guide wires, which did not cause false passage. Lee and colleagues (3) reported false passage in three eyes and Ilgit and colleagues (5) reported false passage in seven eyes. Ilgit and colleagues (5) used balloon catheters with a diameter of 4 mm. Lee and colleagues (3) used balloons with diameters of 4–5 mm, and both Lee and Ilgit inflated the balloon for at least 5 minutes. We inflated a balloon 3 mm in diameter for 30 seconds. The time is sufficient to tear the fibrotic component of the obstruction, and the diameter prevents damage to the lac-



a. b.

Figure 3. **(a)** By immersing it in hot water, the 20-gauge vascular sheath curves at the tip over a wire loop. **(b)** Curve at the tip of the guide wire is shaped by hand at the most distal 3 mm of the wire. Note the curved vascular sheath and the inflated balloon located at the tip of the catheter. Scale is in centimeters.

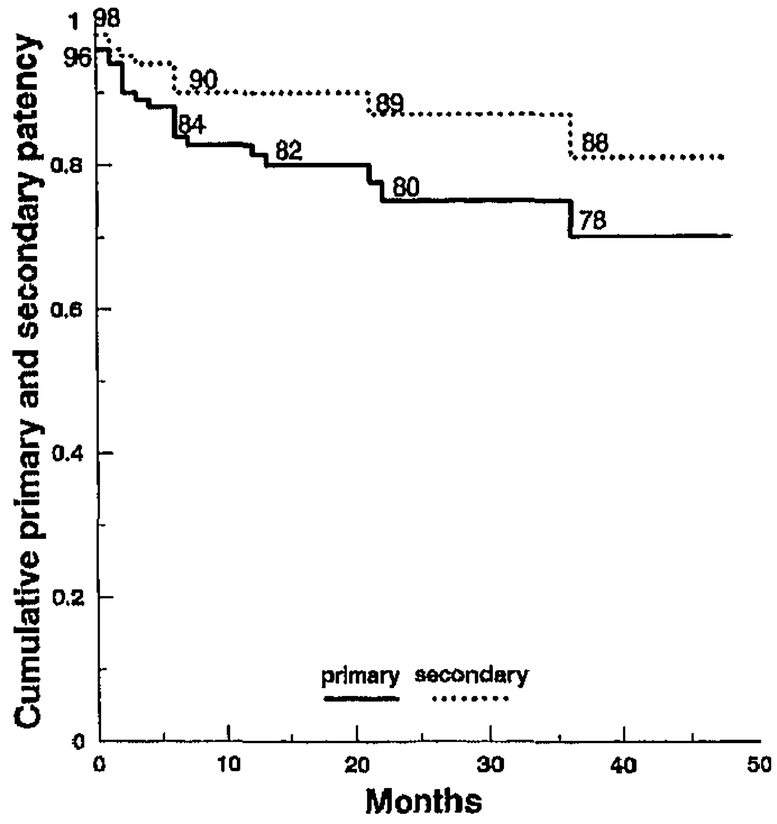


Figure 4. Primary and secondary patency rates after dacryocystoplasty in 100 eyes.

Table 1
Life-Table Analysis of Primary Patency and Secondary Patency after Dacryocystoplasty in 100 Eyes

Outcome	Interval (mo)	No. at Risk	Failures	Cumulative Patency (%)	Standard Error (%)
Primary patency	0–0*	96	4	96	2
	0–1	94	2	94	2
	1–2	90	4	90	3
	2–3	89	1	89	3
	3–4	88	1	88	3
	4–6	84	4	84	4
	6–12	83	1	83	4
	12–13	82	1	81	4
	13–21	81	1	80	4
	21–22	80	1	78	5
	22–36	79	1	75	5
	36–48	78	1	70	7
Secondary patency†	0–0	98	2	98	1
	0–1	96	2	96	2
	1–2	95	1	95	2
	2–6	94	1	94	2
	6–21	90	4	90	3
	21–36	89	1	87	4
	36–48	88	1	81	7

Note.—Success in eyes without reobstruction at 48 months is likely to extend beyond this period.
* Four eyes had initial failure.
† In 11 of 22 cases (four initial failures and 18 reobstructions during follow-up), repeat dacryocystoplasty was performed.

Table 2
Association between Initial Success and Duration of Symptoms

Duration of Symptoms	Initial Success	Initial Failure	Total
≤1 y	29	2	31
>1 y	67	2	69
Total	96	4	100

Table 3
Association between Long-term Success and Duration of Symptoms

Duration of Symptoms	Long-term Success	Long-term Failure*	Total
≤1 y	26	5	31
>1 y	52	17	69
Total	78	22	100

* Four initial failures and 18 reobstructions.

Table 4
Association between Initial Success and Length of Obstruction

Length of Obstruction	Initial Success	Initial Failure	Total
One level	38	0	38
Two to four levels	58	4	62
Total	96	4	100

Table 5
Association between Long-term Success and Length of Obstruction

Length of Obstruction	Long-term Success	Long-term Failure*	Total
One level	30	8	38
Two to four levels	48	14	62
Total	78	22	100

* Four initial failures and 18 reobstructions.

Table 6
Association between Initial Success and Obstruction

Obstruction	Initial Success	Initial Failure	Total
Complete	24	3	27
Partial	72	1	73
Total	96	4	100

Table 7
Association between Long-term Success and Obstruction

Obstruction	Long-term Success	Long-term Failure*	Total
Complete	16	11	27
Partial	62	11	73
Total	78	22	100

* Four initial failures and 18 reobstructions.

rimal duct, assuming that the bony canal in adults is 4–6 mm (11). CT of the lacrimal duct system in the patients in our study revealed that the minimum diameter of the bony canal can be 2.5–4.0 mm. Unlike Lee and colleagues (3) and Ilgit and colleagues (5), we used a catheter with the balloon placed at the catheter tip. As a result, the tip of the catheter did not need to be passed into the common canaliculus in cases with an obstruction high up in the lacrimal sac.

Analysis of the association between (*a*) the dacryocystoplasty results and (*b*) the duration of epiphora or the length of the obstruction demonstrated surprising results. Ilgit and colleagues (5) concluded that their lower overall success rate compared with that reported by Lee and colleagues can partly be attributed to the different times between treatment and the onset of complaints (for Lee and colleagues, a mean of 7.5 years; for Ilgit and colleagues, a mean of 3.4 years). However, we did not find any statistically significant difference in the initial or long-term success rate between patients with epiphora for 1 year or less and those with epiphora for more than 1 year. Also, we did not find a statistically significant difference in the initial or long-term success rate between patients with a short obstruction and patients with an extended obstruction of the lacrimal duct.

A less surprising outcome of our study was the statistically significant difference in the initial or long-term success rate between partial obstructions and complete obstructions. Complete obstructions require recanalization with the guide wire. Similar differences were reported by Lee and colleagues (3) and Ilgit and colleagues (5), despite their different definitions of "complete obstruction." Their approach in defining a complete obstruction is more functional than ours, which means that in their study an obstruction may be considered complete even when the passage of contrast medium is possible.

Although dacryocystoplasty is increasingly being performed to treat epiphora due to lacrimal obstruction, little is known about the underlying mechanism of the procedure. Linberg and McCormick (12) studied pathologic changes in the membranous nasolacrimal duct in patients with acquired nasolacrimal duct obstruction

and found a loose structure of connective tissue around the stratified columnar epithelium of the lacrimal duct. Within this structure, a venous plexus, collections of lymphocytes, and some fibrous tissue were found. In patients with acquired obstruction, (*a*) vascular congestion, (*b*) lymphocytic infiltration, and (*c*) edema cause compression of the duct. This stenosis results in the pooling of tears and infection. Infection increases inflammatory edema and, eventually, gives rise to fibrosis. At the same time, infection might cause reflex hypersecretion of tears. This vicious cycle was also mentioned by Duke-Elder (13).

Hurwitz (14) assumed that in the early stages of obstruction, when fibrosis is still limited, steroid treatment might reverse the process. After dacryocystoplasty, we flushed the lacrimal system with physiologic saline and dexamethasone. Eye drops that contain dexamethasone and gentamicin were prescribed for 1 week. Apart from balloon dilation, this might be an essential factor with respect to the success of the procedure.

Dalgleish (15) flushed the lacrimal duct system in a large series of asymptomatic patients and found obstruction in 9%–10% of patients aged 40 years or older. At the age of 90 years, 35%–40% of patients had obstructions. These patients were asymptomatic because tear production decreases with age. The success of dacryocystoplasty does not necessarily have to be the result of long-term patency of the nasolacrimal duct itself. In some cases, it may be caused by breaking the vicious cycle of obstruction and infection. To test this hypothesis, further study of the lacrimal duct system in patients who are asymptomatic after dacryocystoplasty or dacryocystorhinostomy is necessary.

Currently, epiphora due to obstruction of the lacrimal sac and duct is treated surgically with dacryocystorhinostomy. According to Hurwitz (16), the indications for dacryocystorhinostomy include epiphora due to acquired obstruction within the nasolacrimal sac and duct, a mucocele of the lacrimal sac, chronic dacryocystitis or conjunctivitis due to lacrimal sac obstruction, lacrimal sac infection that must be relieved before intraocular surgery, and congenital nasolacrimal duct obstruction that cannot be cured by probing. Contraindications for dacryocystorhinostomy include acute dacryocystitis and tumor of the lacrimal sac. In fact, these are the same indications and contraindications that we consider appropriate for dacryocystoplasty. In experienced hands, dacryocystorhinostomy has a success rate of 90% (17). Possible complications of dacryocystorhinostomy include orbital emphysema, hemorrhage, infection, or even cerebrospinal fluid leakage (16). In our series, no complications occurred.

The long-term primary patency rate of dacryocystoplasty in our series of 100 obstructed lacrimal duct systems is 70% ± 7. The results of repeat dacryocystoplasty after re-obstruction are good. Repeat dacryocystoplasty was performed in 11 patients, with a successful outcome in 10 patients. We achieved an overall long-term patency rate of 81% ± 7. These results are promising. Dacryocystoplasty appears to be a simple, safe procedure performed with local anesthesia and on an outpatient basis. Compared with dacryocystorhinostomy, dacryocystoplasty is a less invasive and lower cost procedure.

We believe that dacryocystoplasty may become the treatment of choice for epiphora due to obstruction of the nasolacrimal duct system at the saccular or subsaccular level. Dacryocystorhinostomy should be kept in reserve in case of failure of dacryocystoplasty and repeat dacryocystoplasty. In our opinion, dacryocystorhinostomy will continue to be the treatment of choice in cases of posttraumatic or congenital obstruction of the bony canal or obstruction of the nasolacrimal duct due to polyps or granuloma. Placement of a stent in the lacrimal duct system, as advocated by Song and colleagues (18,19), is an interesting possibility, but may cause chronic infection and fibrotic reactions in the long run. Our results indicate that a large number of patients who receive a stent as initial therapy of obstruction of the lacrimal duct system may not require a stent. This suggests that the indications for stent placement should be reconsidered. ■

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